Reducing Environmental Risks

New characterization tools are faster and generate less waste

- **Contamination Analyzer** eliminates sample-handling problems and waiting time for laboratory analysis
- **Cone Penetrometer** minimizes subsurface disturbance and secondary waste generation because no drilling fluids are required
- **Ribbon NAPL Sampler** takes accurate measurements at the source without spreading contamination

Containment systems prevent the spread of contamination while new remediation technologies are developed

- **Viscous Liquid Barriers** can serve as long-term containment or until the contamination source is removed or degraded
- Environmental Management Science Program studies will help optimize **Active Biowalls** to contain toxic metals and radionuclides

In-situ treatment limits exposure of hazardous materials to workers and the environment

- **Passive Reactive Barriers** capture and treat contaminant plumes underground using natural hydrogeologic flow
- **In Situ Redox Manipulation** rapidly immobilizes or eliminates toxic and carcinogenic contaminants within an aquifer and keeps on working

New certification and stabilization methods isolate wastes for safe disposal

- **Waste Inspection Tomography** brings technology to the waste, avoiding transporting waste drums to a characterization facility
- **Polymer Macroencapsulation** isolates waste from the environment in a form that won't deteriorate over time

Contamination Analyzer delivers results in seconds reducing worker exposure and avoiding transport of potentially hazardous samples

Viscous Liquid Barriers can be installed under buildings to effectively contain contaminants in the soil

Polymer Macroencapsulation surrounds wastes and isolates contaminants from the environment

Waste Inspection Tomography allows characterization of mixed waste without opening drums and taking samples

Solutions

Lead Paint Analyzer [#2317]

This portable hand-held instrument identifies RCRA regulated metals in painted surfaces in seconds without sample collection, compared to the baseline approach of scraping, sample packaging, and analysis that may take months to complete. It allows managers to make immediate decisions on remediation steps, reduces the amount of time workers have to spend in hazardous areas gathering and preparing samples, and eliminates sample-handling errors and investigation-derived waste.

Cone Penetrometer [#243]

OST is developing tools to provide accelerated characterization and monitoring data for remediation decision making. These technologies reduce personnel exposure to potentially hazardous materials and eliminate the need to transport potentially hazardous samples off-site. The Cone Penetrometer uses hydraulic “push” technology to penetrate soil surfaces, retrieve samples, and make rapid, continuous measurements. The unit can be fitted with probes and sensors to collect soil moisture, temperature, soil conductivity, and contaminant data.

Ribbon NAPL Sampler [#2238]

Slowly dissolving sources of dense, nonaqueous-phase liquids (DNAPLs) usually reside in thin, highly discrete zones that are difficult to pinpoint. The current DNAPL characterization baseline involves collecting a large number of sediment cores,which could increase the downward migration of contaminants. Using a dye-impregnated ribbon inside a reusable inflatable liner, the Ribbon NAPL Sampler indicates the presence of NAPLs by turning red at the depths where they are located. The sampler is easily deployed into open boreholes. It can also be deployed in collapsing sediments or the saturated zone using a cone penetrometer or other drilling methods.

Viscous Liquid Barrier [#50]

Inert liquids that increase their viscosity after being injected into the subsurface isolate contaminated soils or waste materials and prevent further migration into the surrounding “clean” soils. These barriers may be used as a means of long-term or temporary containment until the contamination source is removed or degraded. The process costs less than excavation and disposal and lowers the risk of bringing contaminants to the surface.

Active Biowalls

The Environmental Management Science Program is providing basic knowledge about the optimal conditions for bacteria to immobilize certain contaminants. The project's overall goal is to understand and model the mechanisms whereby metal-reducing bacteria aid the stabilization of these contaminants in porous soil. Results could lead directly to cost-effective strategies for active biowalls in ongoing or planned remediation projects at Hanford's In Situ Redox Manipulation site, Savannah River's Old Burial Ground, and sites at Oak Ridge's Y-12 Plant.

In-Situ Redox Manipulation [#15]

Many contaminated ground-water plumes are dispersed over large areas and located hundreds of feet below ground. Effective treatment requires in situ manipulation of natural processes to change the mobility or form of the contaminants. ISRM creates a permeable treatment zone where redox-sensitive contaminants in waste plumes are immobilized or destroyed. Human exposure to potentially hazardous materials is greatly diminished because neither contaminated ground water nor matrix material is brought above ground.

Passive Reactive Barrier [#46]

Permeable reactive treatment walls treat/degrade chemicals in groundwater in situ. A permeable, subsurface barrier containing a reactive material (such as granular iron) is constructed across the path of a contaminant plume. When groundwater passes through the reactive barrier, contaminants are either immobilized or chemically transformed to a more desirable state (e.g., less toxic or more readily biodegradable).

Waste Inspection Tomography (WIT) [#259]

The WIT mobile trailer performs nondestructive evaluation and assay of TRU waste drums for radioactive and heavy metals. Workers don’t have to open waste drums and take samples of contents. The mobility of the system also contributes to safety. By bringing the characterization technology to the waste, the risk of transporting waste drums to characterization facilities is avoided.

Polymer Macroencapsulation [#30]

Macroencapsulation involves heating and pouring low-density polyethylene into a specially designed container partially filled with pieces of a solid, contaminated waste such as lead or debris. The plastic flows around, over, and between pieces of waste, coating and bonding to all surfaces of the waste matrix. The process enables greater waste loading in each container, reducing handling, transporting, and disposal costs.

The Tech ID number [#] is used in the Technology Management System. For additional information, visit the Office of Science and Technology Website http://ost.em.doe.gov